

CLAIMS

Sub A1
1. A method of cleaning a surface of a semiconductor wafer following a plasma etching operation, comprising:

5 wetting the surface of the semiconductor wafer by using a non-splash rinse technique, the non-splash rinse technique being configured to quickly and evenly saturate the surface of the semiconductor wafer.

2. A method of cleaning a surface of a semiconductor wafer following a plasma etching operation as recited in claim 1, further comprising:

10 keeping the semiconductor wafer substantially dry after the plasma etching operation and before the wetting operation of the semiconductor wafer.

3. A method of cleaning a surface of a semiconductor wafer following a plasma etching operation as recited in claim 1, further comprising:

15 scrubbing the surface of the wafer with a cleaning brush that applies a chemical solution to the surface of the wafer after the wetting.

20 4. A method of cleaning a surface of a semiconductor wafer following a plasma etching operation as recited in claim 3, wherein the wetting and the scrubbing are performed in a brush box, the brush box having the cleaning brush and a second cleaning brush, the second cleaning brush being implemented to scrub a bottom surface of the wafer.

5. A method of cleaning a surface of a semiconductor wafer following a plasma etching operation as recited in claim 3, wherein the wetting is performed in a brush box and the scrubbing is performed in a second brush box, the second brush box having the cleaning brush and a second cleaning brush, the second cleaning brush being implemented to scrub a bottom surface of the wafer.

6. A method of cleaning a surface of a semiconductor wafer following a plasma etching operation as recited in claim 1, wherein the wetting of the surface of the semiconductor wafer further comprises:

setting a first delivery source and a second delivery source over the surface of the wafer in order to wet the surface of the wafer at a predetermined flow rate of water; and

setting the predetermined flow rate to be between about 50 ml/minute and about 300 ml/minute.

7. A method of cleaning a surface of a semiconductor wafer following a plasma etching operation as recited in claim 6, wherein the wetting of the surface of the semiconductor wafer further comprises:

setting a time of less than about 4 seconds to wet substantially all of a top surface of the wafer.

8. A method of cleaning a surface of a semiconductor wafer following a plasma etching operation as recited in claim 1, further comprising:

rotating the wafer about a radial axis at a rate of between about 2 revolutions per minute and about 20 revolutions per minute.

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9. A method of cleaning a surface of a semiconductor wafer following a plasma etching operation as recited in claim 1, wherein the semiconductor wafer is completely inside a brush box, and no other wafer than the semiconductor wafer that is inside the brush box is exposed to liquid by the wetting.

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10. A method of cleaning a surface of a semiconductor wafer following a plasma etching operation as recited in claim 1, wherein the wetting occurs inside a brush box, and the brush box has no entrance spray.

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11. A method of cleaning a surface of a semiconductor wafer following a plasma etching operation as recited in claim 1, wherein the wetting occurs inside a brush box, and a spin, rinse, and dry (SRD) operation is not performed on the semiconductor wafer after the plasma etching operation and before the wetting.

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12. A system for cleaning a semiconductor wafer after a fabrication operation, comprising:

a brush box, the brush box including:

at least one liquid outlet for applying a non-splash flow of a liquid over the top surface of the semiconductor wafer, the non-splash flow of the liquid being configured to evenly saturate substantially all of a top surface of the wafer.

5 13. A system for cleaning a semiconductor wafer after a fabrication operation as recited in claim 12, wherein the liquid is selected from the group consisting of water and de-ionized water.

10 14. A system for cleaning a semiconductor wafer after a fabrication operation as recited in claim 12, wherein the brush box further comprises:

a top brush and a bottom brush for scrubbing a top surface and a bottom surface of the semiconductor wafer, the semiconductor wafer being configured to sit over the bottom brush and rotate against rollers.

15 15. A system for cleaning a wafer after a plasma etching operation as recited in claim 12, further comprising:

a second brush box, the second brush box including:

20 a top brush and a bottom brush for scrubbing a top surface and a bottom surface of the semiconductor wafer, the semiconductor wafer being configured to sit over the bottom brush and rotate against rollers.

16. A system for cleaning a semiconductor wafer after a plasma etching operation as recited in claim 14, wherein the top brush and the bottom brush used for scrubbing the top surface and the bottom surface of the semiconductor wafer implement a chemical brush cleaning solution.

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17. A system for cleaning a semiconductor wafer after a fabrication operation as recited in claim 12, wherein the at least one top water outlet is arranged relative to the top surface of the semiconductor wafer at an angle, and is raised above the top surface at a raised distance, and overlies an edge of the top surface at an overlying distance.

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18. A system for cleaning a semiconductor wafer after a fabrication operation as recited in claim 17, wherein the angle ranges between about 5 degrees and about 35 degrees.

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19. A system for cleaning a semiconductor wafer after a fabrication operation as recited in claim 17, wherein the raised distance is at least 5 mm.

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20. A system for cleaning a semiconductor wafer after a fabrication operation as recited in claim 17, wherein the overlying distance is between about 3mm and about 20 mm.

Sub A2

21. A method of cleaning a surface of a semiconductor wafer following a plasma etching operation, comprising:

wetting the surface of the semiconductor wafer, the wetting being performed by setting at least one delivery source over the surface of the wafer in order to evenly
5 saturate the surface of the wafer;

the surface of the wafer being quickly saturated in less than about 4 seconds while minimizing splashing over the surface of the wafer.

22. A method of cleaning a surface of a semiconductor wafer following a plasma etching operation as recited in claim 21, further comprising:

setting an outlet end of the at least one delivery source to at least partially overlie an edge of the wafer.

23. A method of cleaning a surface of a semiconductor wafer following a plasma etching operation as recited in claim 21, further comprising:

setting the outlet of the at least one delivery source at an angle relative to the surface of the wafer to range between about 5 degrees and about 35 degrees.

24. A method of cleaning a surface of a semiconductor wafer following a plasma etching operation as recited in claim 21, wherein the plasma etching operation is a tungsten etch-back (WEB) operation.

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